

REMARKS/ARGUMENTS

The title was objected to as not descriptive.

The title was changed to overcome the objection.

Claims 1 and 11 stand rejected under 35 U.S.C. 102(e) as being anticipated by Andricacos; claims 1, 2, 11, 12, and 17 stand rejected under 35 U.S.C. 102(e) as being anticipated by Kim; claims 3-10, 13-16, and 18-22 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Kim as applied to claims 1, 2, 11, 12, and 17, and in view of Wolf and Vaartstra.

Claims 11 through 16 were canceled.

Claim 1 was amended to include the limitations of forming a first metal layer in said trench using physical vapor deposition and a high atomic number metal wherein said high atomic number metal is selected from a group consisting of Ruthenium, Iridium, and Rhodium; and forming a second metal layer in said trench contacting on said first metal layer using chemical vapor deposition and a high atomic number metal wherein said high atomic number metal is selected from a group consisting of Ruthenium, Iridium, and Rhodium. The Andricacos patent does not describe using Ruthenium, Iridium, or Rhodium and claim 1 is allowable over the Andricacos patent under 35 U.S.C. 102(e). Amended claim 1 includes the limitation of forming a second metal contacting on said first metal. The Kim patent describes metal layers 21 and 23 separated by the dielectric layer 22. The metal layers 21 and 23 form the plates of a capacitor with dielectric layer 22 functioning as the dielectric layer. The limitation "contacting on" is clearly shown in the Figures of the instant disclosure and does not represent new matter. Claim 1 is allowable over the Kim patent under 35 U.S.C. 102(e). Claims 3-6 depend on claim 1 and therefore contain all the limitations of claim 1.

Claim 3 comprises specific process conditions suitable to achieve the results of the instant invention. These conditions are not described in Wolf. It is not enough to show that PVD requires sputtering from a metal target. There are an infinite number of possible conditions. The conditions claimed represent an inventive step to achieve the results of the instant invention. Claim 3 is allowable over the cited art.

Claim 4 comprises all the limitations of claim 1. The Vaartstra et al. patent does not contain any of the limitations of claim 1. The Vaartstra patent therefore cannot be properly combined with the Kim patent to reject claim 4. Claim 4 is allowable over the cited art.

Claims 5 and 6 contain the limitations of claim 1 and are therefore allowable over the cited art.

Claim 7 comprises the limitations of forming a trench in a dielectric layer; forming a first metal layer in said trench using a plasma excitation power of 100 to 1000 watts with a DC power of 5KW to 30 KW applied to a sputter metal target comprising Ruthenium; forming a second metal layer in said trench over said first metal layer wherein said forming a second metal layer comprises flowing a vapor containing Ruthenium over a surface heated to between 100°C and 350°C.; and filling said trench with copper by electroplating copper directly on said second metal layer. Claim 7 comprises the limitation of specific process conditions suitable to achieve the results of the instant invention. These conditions are not described in Wolf. It is not enough to show that PVD requires sputtering from a metal target. There are an infinite number of possible conditions. The conditions claimed represent an inventive step to achieve the results of the instant invention. Claim 7 is allowable over the cited art. Claims 8-10 depend on claim 7 and contain all the limitations of claim 7. Claims 8-10 are allowable over the cited art.

Claim 17 comprises the limitations of forming a trench in a dielectric layer; forming a first metal layer in said trench using physical vapor deposition and a high

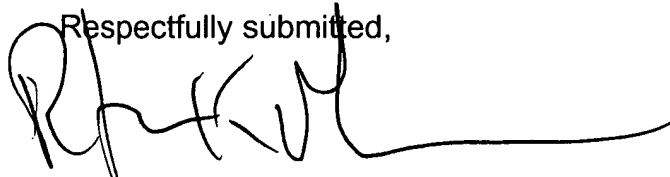
atomic number metal; exposing said first metal layer to a plasma treatment; forming a second metal layer in said trench over said first metal layer using chemical vapor deposition and a high atomic number metal; and filling said trench with copper by electroplating copper directly on said second metal layer. The limitation of exposing said first metal layer to a plasma treatment is not found in any of the cited references. In forming the rejection to claim 17 the examiner refers to paragraph 49 in the Andricacos patent? In this paragraph, a plasma treatment is applied prior to the formation of the first barrier metal 20. Paragraph 49 is therefore not valid prior art for the limitation and claim 17 is allowable over the cited art. Claims 18-22 contain all the limitations of claim 17 and are also allowable over the cited art.

In light of the above, it is respectfully submitted that the present application is in condition for allowance, and notice to that effect is respectfully requested.

While it is believed that the instant response places the application in condition for allowance, should the Examiner have any further comments or suggestions, it is respectfully requested that the Examiner contact the undersigned in order to expeditiously resolve any outstanding issues.

To the extent necessary, Applicants petition for an Extension of Time under 37 CFR 1.136. Please charge any fees in connection with the filing of this paper, including extension of time fees, to the deposit account of Texas Instruments Incorporated, Account No. 20-0668.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Peter K. McLarty', with a long horizontal flourish extending to the right.

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